

# Metals & Alloys

CORE 1.8

Most pure metals come from underground. They are found in “ores” (solid materials called minerals, usually occurring in rock, from which the pure metal has to be extracted). The properties of pure metals can be improved by mixing them with other metals to make alloys. Metals can be divided into ferrous metals, non-ferrous metals, and alloys. For the core section, you need to know the following:



## FERROUS METALS

Ferrous metals contain IRON (ferrite), so they are prone to **rusting** if exposed to moisture. They also have magnetic properties



TYPE	PROPERTIES	COMPOSITION	MELTING POINT	USES
<b>MILD STEEL</b>	Malleable and reasonably tough, ductile, magnetic, high tensile strength, easily joined, prone to rust, strong, inexpensive.	Made up of Iron and 0.1 -0.3% carbon	1400°	Screws Nuts & bolts Girders Car body panels Washing machines
<b>STAINLESS STEEL</b>	Corrosion resistant, hard, tough, resists wear, hard to cut. Doesn't like salt. Durable. Looks good. Safe to use with food. Dishwasher safe. Poor conductor of heat, so often has a copper or aluminium core	<b>ALLOY</b> Carbon Steel and 10.5-18.0% chromium 8%nickel 8% manganese	1400°	Kitchenware Sinks Cutlery Medical equipment
<b>CAST IRON</b>	Hard but brittle, so cannot be bent or forged. Expensive, good in compression, heavy, magnetic, self lubricating. <u>Won't rust.</u>	Iron and 2-6% carbon	1200°	Machine parts Vices Brake discs Manhole covers

## NON-FERROUS METALS

DO NOT contain ferrite, so they have a higher resistance to rust and corrosion. They are **not** magnetic and tend to be more malleable than ferrous metals.



TYPE	PROPERTIES	COMPOSITION	MELTING POINT	USES
<b>ALUMINIUM</b>	Grey-white, corrosion resistant, malleable, ductile, easily machined, good heat/electrical conductor, lightweight, excellent strength to weight ratio, polishes well. Expensive	Pure metal	660°	Aircraft, foil, window frames, engine parts, drinks cans, ladders
<b>COPPER</b>	Red-brown, corrosion resistant, malleable, tough, ductile, good heat/electrical conductor. Good hot or cold to work with, polishes well	Pure metal	1100°	Electrical wire, gas and water pipes, printed circuits, roofing
<b>BRASS</b>	Yellow, corrosion resistant, strong, easily machined, good heat/electrical conductor, casts well, harder than copper, polishes well.	<b>ALLOY</b> 65% copper 35% zinc	900-940°	Plumbing fittings, door handles, locks, keys, musical instruments

<https://www.bbc.com/bitesize/guides/zv4g4qt/revision/1>

**ALLOY**

An alloy is a mixture of 2 or more pure metals. E.g. to add strength, make it corrosion-resistant, make it more lightweight.

<http://www.gojimo.com/gcse-designtechnology-revision/>

<https://youtu.be/AWK7T9bzORA>

[www.technologystudent.com](http://www.technologystudent.com)

Name:




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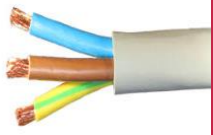

**Task 1**  
Fill the gaps  
in the table

### Ferrous Metals

TYPE	PROPERTIES	COMPOSITION	MELTING POINT	USES
 <div style="background-color: #0070c0; color: white; padding: 5px; display: inline-block; border-radius: 5px;">MILD STEEL</div>	M_____ and reasonably tough, ductile, _____, high tensile strength, easily joined, prone to rust, strong, inexpensive.	Made up of Iron and 0.1 -0.3% carbon	°	Screws Car body panels Washing machines _____
 <div style="background-color: #0070c0; color: white; padding: 5px; display: inline-block; border-radius: 5px;">STAINLESS STEEL</div>	Corrosion _____, hard, tough, resists wear, hard to cut. Doesn't like salt. _____. Looks good. Safe to use with food. Dishwasher safe. _____ conductor of heat, so often has a copper or aluminium core		1400°	Kitchenware Medical equipment _____ _____
 <div style="background-color: #0070c0; color: white; padding: 5px; display: inline-block; border-radius: 5px;">CAST IRON</div>	Hard but brittle, so cannot be bent or forged. Expensive, good in compression, heavy, magnetic, self lubricating. <u>Won't rust.</u>	Iron and 2-6% carbon	1200°	Machine parts Vices Manhole covers _____

**Task 2**  
Fill the gaps  
in the table

### Non-Ferrous Metals

TYPE	PROPERTIES	COMPOSITION	MELTING POINT	USES
 <div style="background-color: #c00000; color: white; padding: 5px; display: inline-block; border-radius: 5px;">ALUMINIUM</div>	Grey-white, corrosion resistant, malleable, d_____, easily machined, good heat /electrical c_____, lightweight, excellent strength to weight ratio, polishes well. Expensive	Pure metal	_____°	_____, foil, window frames, engine parts, drinks cans, _____
 <div style="background-color: #c00000; color: white; padding: 5px; display: inline-block; border-radius: 5px;">COPPER</div>	____-brown, corrosion resistant, malleable, _____, ductile, good heat/electrical conductor. Good hot or cold to work with, polishes well	_____ metal	1100°	Electrical wire, _____ and water pipes, printed circuits, roofing
 <div style="background-color: #c00000; color: white; padding: 5px; display: inline-block; border-radius: 5px;">BRASS</div>	Yellow, corrosion resistant, strong, easily machined, good heat/electrical conductor, casts well, harder than copper, polishes well.	____% copper 35% zinc <div style="background-color: #808080; color: white; padding: 2px; display: inline-block; border-radius: 5px;">ALLOY</div>	900-940°	Plumbing fittings, _____ handles, locks, keys, musical instruments

Task 3: Answer the questions below.

1	Define the term “alloy” and give an example.	
2	Why is aluminium useful for building aeroplane wings?	
3	Why is cast iron useful for manhole covers?	
4	Give two reasons why stainless steel would be chosen over mild steel for bolts on a bicycle.	
	1.	
	2.	
5.	Name the element that is added to iron to make mild steel	
6.	Explain why copper might be suitable for the roof of a building	